Construction Management

BE CE 01

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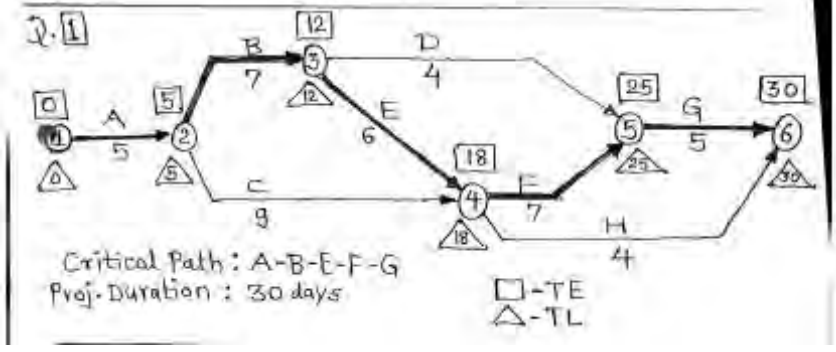
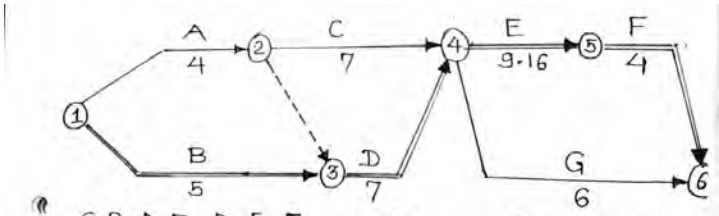
Paper Solution



Activity	Duration (days)	EST	EFT	LST	LFT	Total float TF	Free float FF	Ind. float IndF	Interfering float IntF
A	5	0	5	0	5	0	0	0	0
B	7	5	12	5	12	0	0	0	0
C	9	5	14	9	18	4	4	4	0
D	4	12	16	21	25	9	9	9	0
E	6	12	18	12	18	0	0	0	0
F	7	18	25	18	25	0	0	0	0
G	5	25	30	25	30	0	0	0	0
H	4	18	22	26	30	8	0	8	8

Activity	Preceeding activity	to (days)	tm (days)	tp (days)	Expected time te (days)	Variance (V)	Std. Deviation (σ)
A	—	2	4	6	4	0.444	0.666
B	—	3	5	7	5	0.444	0.666
C	A	5	7	9	7	0.444	0.666
D	A, B	4	7	10	7	1	1
E	C, D	5	9	14	9.16	2.25	1.5
F	E	2	4	6	4	0.444	0.666
G	C, D	3	6	9	6	1	1



C·P ⇒ B-D-E-F

Duration ⇒ 25.16 days.

Expected duration $T_E = 25.16$ days.

Variance $V = \left(\frac{t_p - t_o}{6}\right)^2$

Std. Deviation $\sigma = \sqrt{V}$

• Total Std. deviation σ = $\sqrt{\text{Sum of Variances along C·P}}$

$= \sqrt{0.444 + 1 + 2.25 + 0.444}$

$* \boxed{\sigma = 2.034}$

(ii) Project duration corresponding to 75% Probability

$P = 75\%$

$\therefore Z = 0.733$ (By Interpolation)

$Z = \frac{T_S - T_E}{\sigma}$

After Putting Values $T_S = 26.65$ days.

(iv) Probability of completing the project 3 days earlier than expected date

$T_E = 25.16$ days

$T_S = 25.16 - 3 = 22.16$ days.

$\sigma = 2.034$

$Z = \frac{T_S - T_E}{\sigma}$

$= \frac{22.16 - 25.16}{2.034}$

$Z = -1.47$

∴ By interpolation

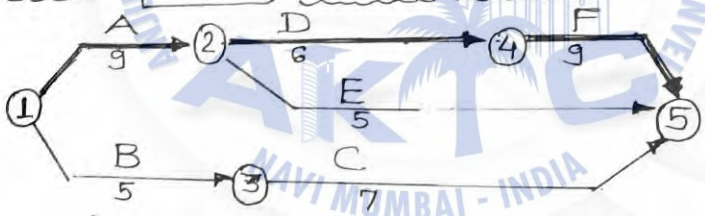
Probability $\boxed{P = 9.48\%}$

∴ Probability of Completing the project 3 days earlier than expected duration = 9.48%

5 (a) * cost slope = $\frac{\text{Crash Cost} - \text{Normal cost}}{\text{Normal Time} - \text{Crash Tim}}$

Activity	Normal Time (days)	Crash Time (days)	Normal Cost (Rs)	Crash Cost (Rs)	Cost Slope
A	9	6	8000	9500	500
B	5	3	5000	5500	250
C	7	4	6500	10500	1333.30
D	6	4	7000	10000	1500
E	5	3	4500	7500	1500
F	9	5	5500	9000	875

Solution : Step I original network



Critical path ⇒ A-D-F
Project Duration = 24 days
Direct cost = sum of all normal costs
= Rs. 36500/-

Step II Crash activity A (As its cost slope is le

C.P ⇒ A-D-F
Duration ⇒ 21 days.
Direct cost ⇒ 36500 + (9500-8000)
= Rs. 38000/-

Step III

Step IV Crash activity 'D'

C.P ⇒ A-D-F

Duration = 15 days

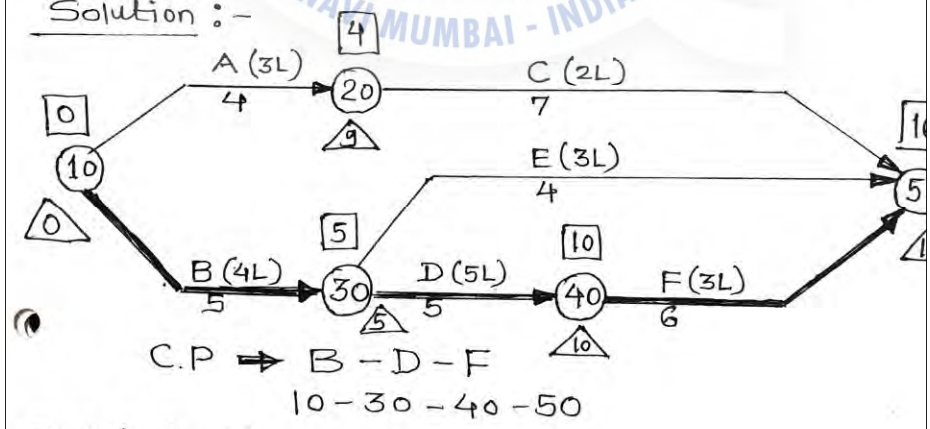
Direct cost = 41500 + (10000 - 7000)

= Rs. 44500/-

Step	Duration (days)	Direct Cost (Rs)	Indirect cost (Rs) @ 1500/day	Total Cost (Rs)	Remark
I original	24	36500	36000	72500	
II Crash A	21	38000	31500	69500	
III Crash F	17	41500	25500	67000	
IV	15	44500			

Q. 4 (a) Resource allocation problem

Solution :-



C.P ⇒ B - D - F

10 - 30 - 40 - 50

Project duration = 16 days.

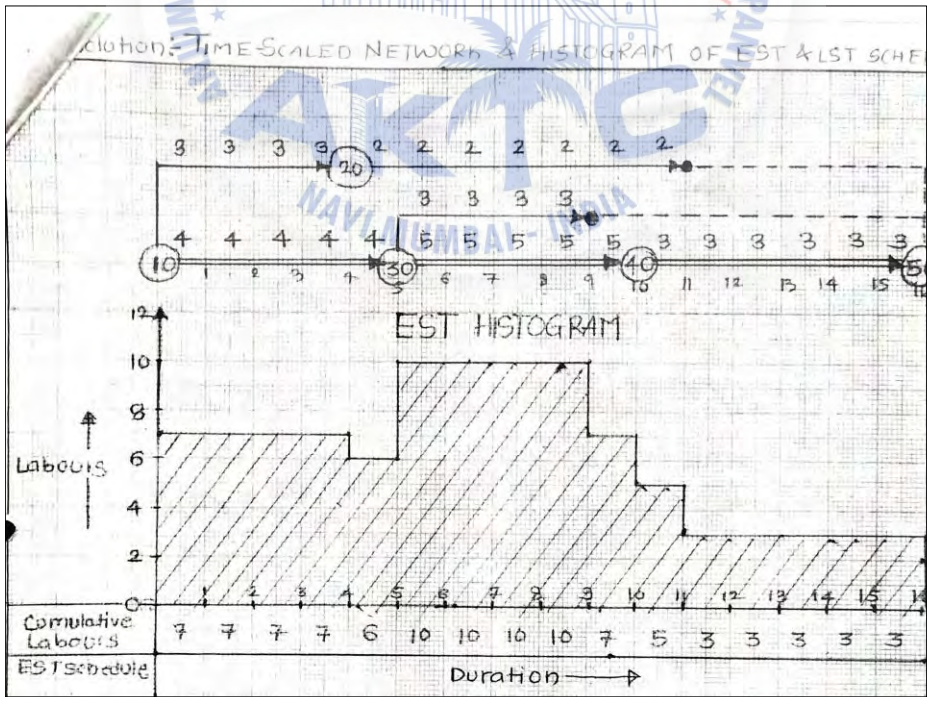
Activity	Duration (days)	EST	EFT	LST	LFT	Total float
A	4	0	4	5	9	5
B	5	0	5	0	5	0
C	7	4	11	9	16	5
D	5	5	10	5	10	0
E	4	5	9	12	16	7
F	6	10	16	10	16	6

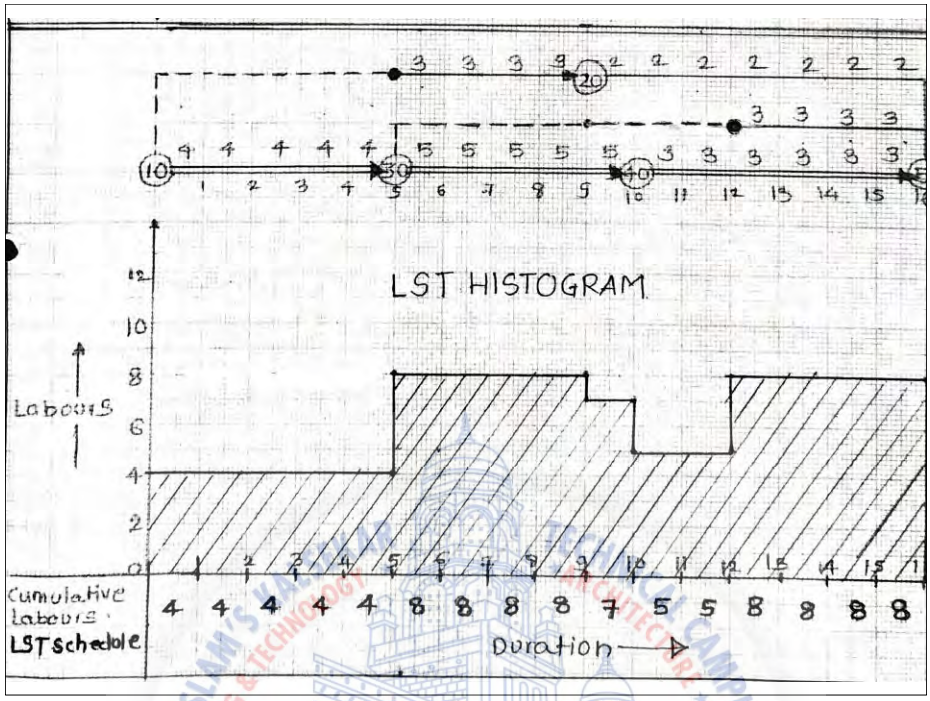
Graphs → Time scaled version network & Histogram

EST Histogram → Peak requirement of labour

LST Histogram → Peak requirement of labour =

* As peak requirement of labour as per LST sch is less than that of EST schedule, LST schedule will be Preferred.





Q.5 (a) Calculation of NPV

Year	0	1	2	3	4	5
Cashflow (Rs)	2,00,000	50,000	60,000	60,000	70,000	75,000

Rate of Interest = 7%

Solution :-

$$NPV = \frac{CF_0}{(1+r)^0} + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n}$$

$$= \frac{-2,00,000}{\left(1+\frac{7}{100}\right)^0} + \frac{50,000}{\left(1+\frac{7}{100}\right)^1} + \frac{60000}{\left(1+\frac{7}{100}\right)^2} + \frac{60000}{\left(1+\frac{7}{100}\right)^3} + \frac{70000}{\left(1+\frac{7}{100}\right)^4} + \frac{75000}{\left(1+\frac{7}{100}\right)^5}$$

NPV = Rs. 54,890/-

* As net present value of the project is +ve, Project should be accepted.